Long.	Lat.	Long.	Lat.
179° 51′ E. ...	25° 43′ S. ...	139° 51′ W. ...	6° 53′ S.
168 19 W. ...	19 52 S. ...	137 44 W. ...	6 24 S.
160 49 W. ...	15 49 S. ...	119 52 W. ...	5 51 S.
140 46 W. ...	7 8 S. ...	108 12 W. ...	7 51 S.

By a direct calculation for a point 140° 46′ W., 7° 8′ S. in the longitude of the Marquesas, totality is found to commence at 0h. 39m. 30s. local mean time, duration 5m. 15s., the sun at an altitude of 64°.

THE MINOR PLANETS.—The four older minor planets, Ceres, Pallas, Juno, and Vesta, are now in pretty favourable positions for observation, and Vesta, which will be in opposition on the 28th inst., is very little below an average sixth magnitude in brightness, and may probably be detected without the telescope by those who are gifted with strong sight and are acquainted with the planet's position with respect to stars in the vicinity. On the 28th it will be a very little to the left of the line joining δ and ϵ Virginis, and nearly equi-distant from these stars, which are of the third magnitude.

Niobe, like Euphrosyne, is occasionally situate at a considerable declination. At the beginning of November next she nearly attains 53° N. in the constellation Camelopardus. An observer who may chance to meet with a small star which he has not before seen at a great distance from the equator, must not too hastily conclude that it belongs to the list of variables.

No. 160 was discovered by Prof. Peters at Clinton, U.S., on the morning of Feb. 21; it has been observed at Marseilles by M. Borrelly.

ON THE ACTION OF LIGHT ON SELENIUM

ON the 18th of last month Dr. C. William Siemens gave a lecture to the members of the Royal Institution on the above subject.

Commencing with a general reference to light as a natural force, he showed how little the potential action of light made itself evident to our senses, as with the disappearance of the light its effects seemed entirely to vanish; he then showed a temporary effect of light by its action on phosphorescent salts, which continue to glow for a long time after the source of light is removed, and drew attention to the permanent effect produced by the decomposition of the salts of silver in photography. He next referred to the radiometer, Mr. Crookes' little machine for illustrating light effects, which he brought forward for the purpose of showing the motive power of light, and closed his introduction by a reference to some experiments which he had made on a fungus that lives in the dark, and which, on analysis, gave no evidence of containing carbon, thus helping to favour the hypothesis *that it is not heat, but the ray of light which breaks up carbonic acid in the leaves of plants in order to separate the carbon.*

Selenium was discovered in 1817 by Berzelius, as a bye product from the distillation of iron pyrites. It is fusible, combustible, and similar to sulphur, phosphorus, and tellurium. If melted (at 217° C.) and cooled rapidly, it presents a brown amorphous mass of conchoidal fracture, and is a non-conductor of electricity; if heated only to 100° C., and retained for some time at this temperature, it becomes crystalline, and is a slight conductor of electricity, the conductivity increasing with battery power, and varying according to the direction of the current, as lately observed by Prof. Adams.

It was on the 12th of February, 1873, that the Society of Telegraph Engineers received a communication from Mr. Willoughby Smith, one of its members, of an observation made first by Mr. May, a telegraph clerk at Valentia, viz. that a stick of crystalline selenium offered considerably less resistance to a battery current when exposed to the light than when kept in the dark; this was corroborated by the Earl of Rosse, who clearly proved the action to be due *solely* to light, and who also showed the effects of the light of different portions of the spectrum, and afterwards by Lieut. Sale, and conjointly by Messrs. H. N. Draper, F.C.S., and R. J. Moss, F.C.S.

About twelve months ago the matter was again taken up by two independent observers, Prof. Adams in this country, and Dr. Werner Siemens in Germany, and it was to the results obtained by the latter, and which have been communicated to the Academy of Sciences of Berlin, that the lecturer's remarks were chiefly confined.

The sensitive selenium plates made by Dr. Werner Siemens, with which experiments were made, are formed of two spirals of platinum wire, laid upon a plate of mica, in such a manner that the two wires run parallel without touching; upon the plate a drop of molten selenium is allowed to fall, and before solidifying, another plate of mica is pressed down; the two protruding ends of wire serve to insert the selenium element in a galvanic circuit. Amorphus selenium when thus tested produces no deflection of the galvanometer, either in light or darkness. If, however, a selenium disc which has been kept for some time at 100° C. and then cooled is inserted, a slight deflection of the galvanometer takes place when it is under the influence of light, but none in darkness. If now a selenium disc which has been kept for several hours at a temperature of 210° C., a point below that of the fusion of selenium, and which has been gradually cooled, is substituted for the other, a considerable deflection under the influence of light will be observed, whilst a hardly perceptible deflection takes place in the dark.

It was also explained, as the result of an experiment, that amorphous selenium did not conduct up to 80° C.; from this temperature to 210° C., its conductivity gradually increased, after which the conductivity again diminished; in cooling it followed the same law, but in a different ratio. The modification prepared by heating to 100° C. only is Dr. Werner Siemens' 1st, or electrolyte modification, whilst the other, prepared by heating to 210° C., is his 2nd, or metallic modification. In the 1st, the conductivity *increases* with rise of temperature; in the 2nd it *decreases*; the 2nd is a much better conductor, but is less stable, and its conductivity increases with the intensity of the light, as shown from the following table, in which is given the effects of different intensities of light on selenium (Modification II.) obtained by Dr. Obach in Mr. Siemens' laboratory at Woolwich on the 14th February, 1876:—

Selenium in	Relative conductivities.		Resistance in Ohms.
	Deflections.	Ratio.	
1. Dark	32	1·	10,070,000
2. Diffused daylight ...	110	3·4	2,930,000
3. Lamplight...	180	5·6	1,790,000
4. Sunlight	470	14·7	680,000

From these experimental results an extension of Helmholtz's theory is derived, viz., that the conductivity of metals varies inversely as their total heat (Helmholtz having only the sensible heat in view), and the influence of light upon selenium is explained by a change in its molecular condition near the surface, from the first or electrolyte into the second or metallic modification, or, in other words, by a liberation of specific heat upon the illuminated surface of the crystalline selenium.

In testing the sensitive selenium plate in the different parts of the spectrum, it was shown that the actinic ray exercised no sensible effect, that the effect increases as we gradually approach the dark red, and that beyond that point the effect again decreases, reaching almost zero in the heat rays; the value of the material then for purposes of photometry is apparent.

Dr. Werner Siemens has constructed a selenium photometer, in which the selenium is prepared so as not to be affected by the changes to which that substance is liable, and which consists of a single sensitive plate mounted upon a vertical axis, upon which it can be turned through a certain angular distance limited by stops. When touching the one stop the selenium stands opposite the normal candle, and when touching the other opposite the light to be measured, the distance upon the former being changed upon a scale until no effect upon the needle of a galvanometer is produced in turning the sensitive plate in rapid succession from the one stop to the other.

The lecture was concluded by the exhibition of a selenium eye, which Mr. Siemens had prepared to illustrate the extraordinary sensitiveness of the selenium preparations. It consists of a hollow ball with two circular openings opposite each other, the one being furnished with a lens 1½ inches in diameter, and the other with an adjustable stopper carrying a sensitive plate, which is connected by wires to a galvanometer and one Daniell's cell. The lens is covered by two slides representing eyelids, the ball itself being the body of the eye, and the sensitive plate occupying the place of the retina. Having placed a white illuminated screen in front of the artificial eye, on opening the eyelids a strong deflection of the galvanometer was observed, a black screen giving hardly any deflection, a blue one a greater, a red a much greater, but still short of that produced by the reflected white light. The eye was thus sensitive to light and colour, and as stated, it would not be difficult to arrange a contact and electro-magnet in connection with the galvanometer, so that intense light would cause the automatic closing of the eyelids. The artificial eye is subject to fatigue, and the lecturer considered that this experiment might be suggestive to physiologists as regards the natural conjoint action of the retina and the brain.

THE LATE COLONEL STRANGE, F.R.S.

LIEUT.-COL. ALEXANDER STRANGE, F.R.S, whose death we last week announced, was the fourth son of the late Sir Thomas Strange, and was born at Westminster on the 27th of April, 1818, and was educated at Harrow. On leaving school in 1834, at the early age of sixteen, he proceeded to India, and joined the 7th Regiment of Madras Light Cavalry, where his natural talents began to develop themselves. He shortly afterwards made the friendship of General Worster, who soon discovered that he had mechanical abilities of the highest order, and who subsequently instructed him in the use of astronomical and surveying instruments, and pointed out to him that nature had intended him for a scientific career. During the next few years he became a devoted student at the Magnetic and Meteorological Observatory at Simla, then under the direction of Major-General Boileau, R.E., at whose recommendation he was nominated, in 1847, by Col. (now Sir Andrew) Waugh, R.E., Surveyor-General of India, to the office of Second Assistant in the Great Trigonometrical Survey, where he found work suited to his talents. He was originally selected on account of his ability as an observer, and for his extraordinary mechanical skill, which in this department was of special value, and was displayed in such a remarkable degree as to call forth the highest commendation from Col. Waugh. In the season 1848-49 he was attached to the party under Capt. (now Col.) Renny Tailyour, R.E., in order that he might acquire a practical knowledge of geodetical operations. Such was the rapidity with which he made himself master of this difficult subject, that in 1850 he was promoted to the grade of First Assistant. Capt. Tailyour was ordered to undertake the triangulation of what is known as the "Karáchi Longitudinal Series," which constitutes the southern flank of that considerable portion of the principal triangulation of the Survey of India known as the North-west Quadrilateral. It commences at Sironj in Central India, and terminates at Karáchi, in Sind. The extent of this arc of longitude is equivalent to 670 miles in length, covers an area of 23,000 square miles, and is one of the largest longitudinal arcs ever measured on the surface of the globe. At the end of the first season, Capt. Tailyour's services being required at head-quarters, Capt. Strange was ordered to take over the entire charge of the Series, and it is on this great undertaking that his fame as an Indian Surveyor rests. After crossing the Desert, over which the triangulation had to be carried nearly 200 miles, the work was carried on with the highest skill across the Plains of Sind, until at length, after much anxiety, and having overcome almost insuperable difficulties, the last angle which completed this great triangulation was measured on April 22, 1853, and the work brought to a successful close.

The remarkable energy and rapidity with which this series was carried on, under many and great difficulties, was reported by the Surveyor-General to reflect on him the highest credit. He was directed to join the Surveyor-General's camp near Attock, where he took part in the verificatory base line. After this he returned to Karáchi with the base-line apparatus, and took a leading share in the measurement of the base-line at that place in the year following. Meantime he had been distinguished with the title of "Astronomical Assistant." In 1855 Strange joined the Surveyor-General's Head Quarters' Office, and in the following year was placed in charge of the triangulation which was being extended from Calcutta southwards towards Madras, along the eastern coast. In April, 1857, whilst conducting the triangulation in the Goomsoor Hills, a notoriously unhealthy tract, he was struck down by jungle fever, and was afterwards ordered to the Neilgherry Hills for the recovery of his health. In the year 1859 he was promoted to the rank of major, and in accordance with the then existing regulations of the service retired from the Survey, on which occasion he received the special thanks of the Government of India.

In January, 1861, he returned to England after twenty-six years' continuous service in India, and finally retired from the army as lieutenant-colonel on the 31st of December, 1861. His career in England was no less brilliant than that in India. In 1861 he was elected a Fellow of the Royal Geographical Society as well as a Fellow of the Royal Astronomical Society. He served on the Council of the latter from 1863 to 1867, and was Foreign Secretary from 1868 to 1873. On the 2nd of June, 1864, he was elected a Fellow of the Royal Society, of which he soon became a distinguished member; he served on the Council from 1867 to 1869.

In the year 1862 the Secretary of State for India in Council sanctioned the provision of an extensive equipment of geodetical and astronomical instruments of the first order, for the service of the Great Trigonometrical Survey of India, consisting of one great theodolite, two zenith sectors, two 5-feet transit instruments, two electro chronographs, two diagonal transit instruments, two 12-inch vertical circles, and three astronomical clocks. The task of designing and superintending their construction was entrusted to Lieut.-Col. Strange, who was also appointed to the post of Inspector of Scientific Instruments to the Indian Government. To enable him to test these valuable instruments as well as the current supply required by the Public Works, Survey, Meteorological, and various other Departments in India, an Observatory was established at the India Store Depôt in Lambeth from designs prepared by himself. This observatory, in its various ingenious details, is a monument of Col. Strange's consummate mechanical genius.

At this Observatory, theodolites, levelling instruments, prismatic compasses, sextants, telescopes, barometers,